

## U. S. CITRUS PRODUCTION

For many years Florida has been the nation's dominant state in production of citrus. During the last decade nearly three quarters of all U.S. citrus was grown in Florida.

Production of U.S. Citrus by States					
Season	FL <sup>1/</sup>	CA	TX	AZ	U.S. total
<i>Thousand tons</i>					
1998-99	10,827	2,266	305	235	13,633
1999-00	13,305	3,457	308	206	17,276
2000-01	12,433	3,197	383	203	16,216
2001-02	12,824	2,907	310	153	16,194
2002-03	11,206	3,530	292	152	15,180
2003-04	13,045	2,855	298	162	16,360
2004-05	7,597	3,511	339	127	11,574
2005-06	7,832	3,460	277	185	11,745
2006-07	7,236	2,743	368	120	10,467
2007-08	9,119	3,470	318	90	12,997

<sup>1/</sup> Does not include lemons. Limes and K-Early Citrus Fruit included through 2001-02.

## FLORIDA'S OBJECTIVE CITRUS FORECAST

Advance knowledge of crop size permits early decisions for planning operations, marketing, and policy making, which are especially important to a crop which is harvested over several months and sold year round. The U.S. Department of Agriculture first made forecasts of Florida citrus production in 1918, based on survey opinions of crop observers and statisticians. The need for greater accuracy in these forecasts intensified as Florida's production increased. Florida's participation in world markets underlines the need for comprehensive and accurate information to successfully compete in these markets.

The interest in a statistically accurate forecast has led to the current system based on objective data including an early season limb count survey to establish actual fruit set, supplemented with monthly in-season measurements of fruit size and observations of fruit droppage. This system of the forecasts and estimates is possible through an industry supported per-box assessment on all Florida production. The resulting trust fund is used to collect much of the objective survey data for the USDA forecast and estimates.

Florida's Citrus Production by Seasons				
Season	Oranges	Grapefruit	Others	Total
<i>Million boxes</i>				
1998-99	186.0	47.1	10.1	243.2
1999-00	233.0	53.4	12.0	298.4
2000-01	223.3	46.0	9.5	278.8
2001-02	230.0	46.7	10.6	287.3
2002-03	203.0	38.7	9.3	251.0
2003-04	242.0	40.9	8.9	291.8
2004-05	149.8	12.8	6.7	169.3
2005-06	147.7	19.3	7.6	174.6
2006-07	129.0	27.2	5.9	162.1
2007-08	170.2	26.6	7.0	203.8

## COMMERCIAL TREE CENSUS

The commercial tree census, done every year, provides a complete record of trees and acreage by counties for each citrus type and variety, by year planted. In addition to its use for decisions on planting and future planning, the census provides a sampling frame for the objective forecasting surveys—the statistical sample of groves is drawn from the census records. Thus, resulting estimates from the same survey data may be used with statistical confidence obtainable only with a probability sample.

The census has previously used aerial photographs of about 14,000 square miles of the Florida peninsula covering virtually all citrus growing areas. Photos were taken at 15,000 feet on black and white panchromatic film. The resulting exposures with a scale of 1:30,000 cover a three-mile wide swath on the ground, and the same flight lines were followed for each census. The first such photos were taken in late 1965 and used for the January 1966 census. For that census survey, photo enlargements were obtained and every block of citrus was identified on the ground and mapped onto an enlargement. The resulting record of each planting has been updated, amended, and added to at every census since then, through the use of photo comparison and subsequent survey work in the groves.

Now, remotely sensed data allows for rapid replacement and maintenance of background images. Grove boundaries are digitized and saved as geodatabases in our geographic information system (GIS). The software provides additional tools to enhance comparative photo interpretation for grove change detection. Field checking of new and altered acreage follows. Changes detected on images and in field observations are used to update the previous inventory. This technology provides current tree inventory data for evaluating Florida's potential citrus production in a shorter period of time and at less cost than by ground survey methods alone.

Florida Commercial Citrus Acreage as of January				
Survey year	Oranges	Grapefruit	Others	Total
<i>Acres</i>				
1988	536,737	119,606	41,586	697,929
1990	564,809	125,300	42,658	732,767
1992	608,636	135,166	47,488	791,290
1994	653,370	146,915	53,457	853,742
1996	656,598	144,416	56,673	857,687
1998	658,390	132,817	54,053	845,260
1999 <sup>1/</sup>	--	121,258	--	--
2000	665,529	118,145	48,601	832,275
2002	648,806	105,488	43,009	797,303
2004	622,821	89,048	36,686	748,555
2006	529,241	63,419	28,713	621,373
2008	496,518	56,881	23,178	576,577

<sup>1/</sup> Special grapefruit survey.

## OBJECTIVE SURVEY METHODS

The annual citrus crop production forecast is based on estimates and projections from actual counts and measurements, avoiding observations based on opinion or judgment. These objective procedures are simple in concept but complex in planning, management for efficiency, and quality assurance.

The four basic parameters used in the forecast are (1) number of bearing trees, (2) number of fruit per tree, (3) fruit size, and (4) fruit loss from droppage. The first two of these parameters have the greatest influence on the forecast. The general model incorporates the estimated total fruit (bearing trees times average fruit per tree), divided by the number of fruit projected to make a standard box at harvest (using the fruit size survey), reduced for droppage (the fraction of fruit counted at survey time but lost to droppage before it is harvested).

$$\text{Production Indicator} = \frac{\text{Bearing Trees} \times \text{Fruit per Tree} \times \text{Percent Remaining at Harvest}}{\text{Pieces of Fruit per Box}}$$

The sample design used to obtain each parameter stratifies the State's citrus belt into five nearly homogeneous areas and the bearing trees into five age groups. Sample groves for surveying are selected from the citrus tree inventory using probability sampling procedures. The samples are mapped on copies of aerial photo enlargements and indexed for reference.

Developed during the mid-1950's, the Limb Count survey conducted from mid-to-late summer has become the basic tool for estimating the average number of fruit on Florida's citrus trees. Annually as many as 3,200 sample groves are drawn from the tree census data by type, to be representative of their population. Survey crews are then dispatched to these groves. At each sample site, two trees are chosen at random for sampling.

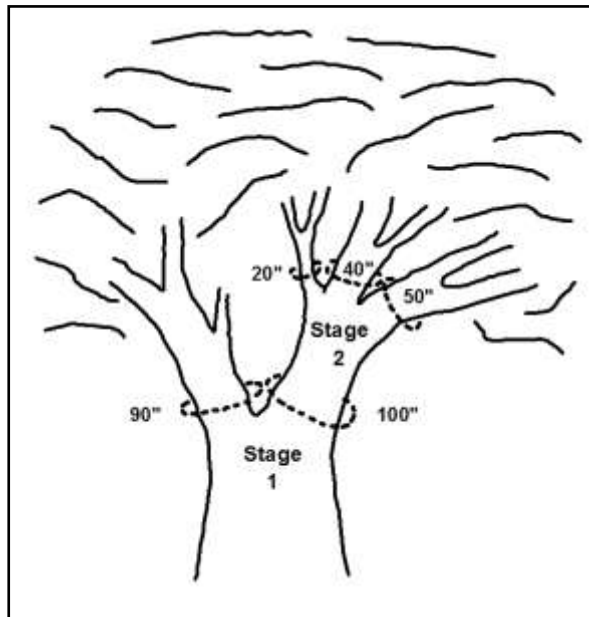
A sample limb representing approximately 10 percent of the bearing surface of each tree is randomly selected based on the cross sectional area measurements of limbs, starting at the trunk or scaffold and moving in successive stages up the tree. Fruit is then counted on this sample limb, with random recounts by supervisors to maintain quality control. The procedure utilizes the correlation between limb size and the fruiting ability of that limb—thus it is most efficient to sample more trees and count only a small part of each tree.

Fruit counts are then expanded by the reciprocal of the probability of selection to a total tree basis. This design results in the reliable estimates of average fruit per tree.

## SIZE AND GROWTH OF FRUIT

Another important parameter in the forecast is the expected fruit size. Fruit size measurement surveys are conducted monthly from August to harvest on two trees in each of about 1,800 sample groves.

Circumference calipers, which have proven to be the most sensitive tool to measure subtle changes in size, are used for this survey. Fruit size is projected to harvest by use of growth charts, historical relationships of current survey data to final results, and other relationships to detect similar-year growth. Fruit circumference is converted to number of fruit per box to report the forecast in boxes.



## FRUIT LOSS FROM DROPPAGE

Fruit droppage is the final factor which must be considered to develop a reliable forecast of production. This requires monthly observations of fruit loss from many sample branches. These sample branches are tagged and the fruit is counted at the same time as the Limb Count survey. Then at monthly intervals, the same branches are recounted. Cumulative fruit loss for the season and historical data from previous seasons are used to project fruit loss to harvest time.

The resulting October forecast is subject to change in later months due to weather conditions that affect fruit sizing and droppage rates.

## CITRUS MATURITY AND YIELD SURVEY

Another feature of the Florida citrus forecasting program is the projected yield of frozen concentrated orange juice (FCOJ) for oranges, expressed in gallons of concentrate per box. This projection is important for fruit used in processing which is a major portion of the orange production.

Sample groves and trees remain relatively constant from year to year in order to assure the greatest continuity of data. Fruit samples are collected monthly throughout the season and tested for acid, solids, and unfinished juice. The projection of FCOJ yield per 90 pound box equivalent is based on a statistical regression of these unadjusted maturity and yield test results to actual yields at processing plants during past seasons. The level of maturity, weather, and harvest patterns all play a substantial part in the final result.

Prior to freezes in the mid-1980's, the Florida citrus industry annually produced approximately 90 percent of the nation's supply of frozen concentrated orange juice. In recent years, more fruit has been going to fresh squeezed products.

Florida's Frozen Concentrated Orange Juice (FCOJ)

Season	Boxes used	Average yield	Product
	<i>Thousand boxes</i>	<i>1/</i>	<i>Thousand gallons</i>
1998-99	97,247	1.63	158,884
1999-00	134,204	1.55	207,708
2000-01	124,072	1.58	196,055
2001-02	135,975	1.58	215,057
2002-03	102,073	1.54	156,845
2003-04	139,727	1.56	218,296
2004-05	54,322	1.58	85,998
2005-06	51,873	1.63	84,600
2006-07	47,996	1.65	79,054
2007-08	80,817	1.67	135,196

<sup>1/</sup> Gallons per box at 42° Brix.

## OTHER SURVEYS AND STATISTICS

From the objective surveys, estimates of production by counties and boxes of fruit per tree by types and ages are reported in the preliminary Production and Value release. It is followed by the annual Citrus Summary. From the annual tree census surveys, tree and acreage changes are shown by fruit types, counties, and year set in the preliminary Tree Census release and the Commercial Citrus Inventory.

A monthly route survey is conducted during the season to estimate the percent of fruit harvested to date. Additional crop statistics are provided as the need arises. These include surveys following such disasters as hurricanes and freezes.

## VALUE OF FLORIDA'S CITRUS CROP

Florida citrus production represents about one fifth of the total value of farm production in the State. Farm production value is the product of total units sold and the average price received by the producer.

Average prices received are estimated monthly for sales for fresh use and for processing, based on current sales information. These estimates are combined with sales volume to calculate a season average price. The price estimates, especially for processing, are subject to revision after the closing of cooperative pools, about one year later, since about one half of the orange crop is sold through cooperative and participation plans.

Price estimates are made and published for a 90-pound box equivalent of oranges and 85 pounds of grapefruit. The price received by growers for fruit processed is for pounds of sugar solids delivered to the processor. In recent years, over 90 percent of oranges and 50 percent of grapefruit were processed.

Prices are reported at two levels: The on-tree value of sales, which excludes the cost per box for picking and hauling the fruit to the packinghouse, and the value per box delivered to the packinghouse.

On-Tree Value of Florida's Citrus

Season	Oranges	Grapefruit	Others	Total
	<i>Thousand dollars</i>			
1988-89	1,086,319	243,874	99,615	1,429,808
1989-90	684,226	201,756	66,321	952,303
1990-91	892,675	255,328	88,123	1,236,126
1991-92	828,749	280,629	99,566	1,208,944
1992-93	649,713	146,432	59,667	855,812
1993-94	713,312	167,211	59,331	939,854
1994-95	767,924	116,602	63,647	948,173
1995-96	895,465	101,140	79,212	1,075,817
1996-97	801,344	88,009	71,143	960,496
1997-98	900,815	63,000	59,568	1,023,383
1998-99	900,044	108,411	88,798	1,097,253
1999-00	856,052	188,332	64,139	1,108,523
2000-01	716,055	100,869	45,107	862,031
2001-02	797,602	107,653	61,548	966,803
2002-03	643,804	94,518	49,056	787,378
2003-04	699,927	136,295	55,278	891,500
2004-05	522,892	172,365	58,912	754,169
2005-06	813,332	149,655	61,633	1,024,620
2006-07	1,310,382	120,280	68,450	1,499,112
2007-08 <sup>1/</sup>	1,057,375	112,946	41,618	1,211,939

<sup>1/</sup> Preliminary.

## FORECAST ACCURACY

Each forecast is subject to inherent sampling errors, but during recent seasons without freezes or hurricanes, the average deviation from the October forecast to the final pickout has been slightly under four percent for oranges and under six percent for grapefruit.

October Forecast Versus Final Production

Season	Oranges		Grapefruit	
	October	Final	October	Final
<i>Million boxes</i>				
1996-97	220.0	226.2	59.0	55.8
1997-98	254.0	244.0	54.0	49.6
1998-99	190.0	186.0	50.0	47.1
1999-00	211.0	233.0	50.0	53.4
2000-01	240.0	223.3	50.0	46.0
2001-02	231.0	230.0	48.0	46.7
2002-03	197.0	203.0	42.0	38.7
2003-04	252.0	242.0	42.0	40.9
2004-05 <sup>1/</sup>	176.0	149.6	15.0	12.8
2005-06 <sup>1/</sup>	190.0	147.7	24.0	19.3
2006-07	135.0	129.0	26.0	27.2
2007-08	168.0	170.2	25.0	26.6

<sup>1/</sup> Hurricane-affected season.

## FORECAST SECURITY

The citrus crop forecast is released by the USDA's National Agricultural Statistics Service in Washington, D.C., on or before the 12<sup>th</sup> day of the month, reflecting conditions as of the first of that month. The report is always released at 8:30 a.m., before the opening of business on the "Futures Market." This is done to permit all concerned an equal opportunity to have access and review the statistics before trading resumes.

To insure absolute security of the information, all orange survey data is summarized in restricted areas and ultimately assembled for release in the lock-up area of the National Agricultural Statistics Service. An oath of loyalty is administered to all employees of the Department and they are subject to punishment for early release of information or for reporting erroneous data.

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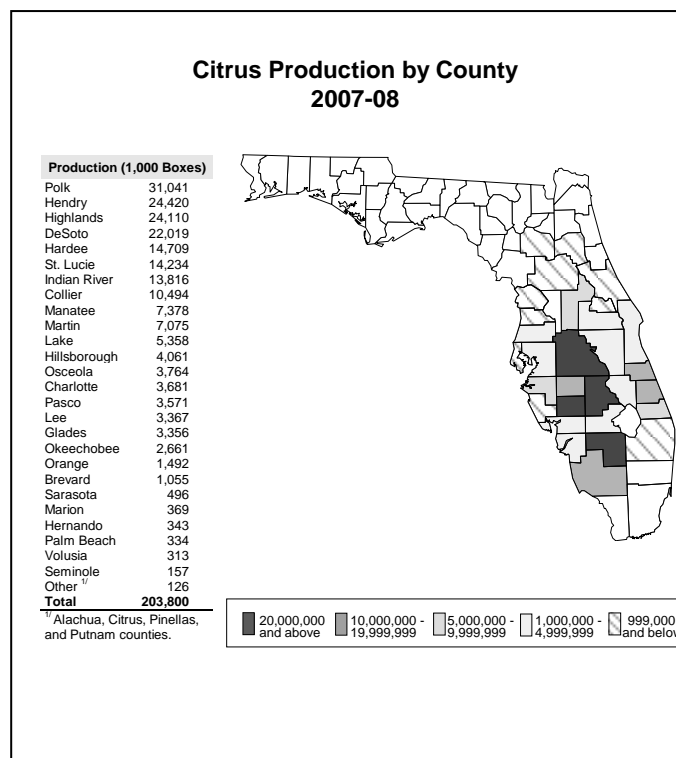
Printed August 2009

## FORECASTING

## FLORIDA'S

## CITRUS

## PRODUCTION



## FLORIDA'S CITRUS CROP STATISTICS

The USDA's National Agricultural Statistics Service Florida Field Office works cooperatively with the Florida Department of Agriculture and Consumer Services and the University of Florida. The office is responsible for gathering and reporting Florida's agricultural statistics. Major crop and livestock statistics are reported with various statistical methods used to prepare the information released. This brochure explains the process used to forecast citrus crop production.